

ART. III.—*A Commentary on “A Communication made by the Rev. W. B. CLARKE to His Excellency Sir HENRY BARKLY, K.C.B., &c., &c., President of the Royal Society of Victoria, on Professor MCCOY’S new *Teniopteris*, &c., &c.”—By FREDERICK MCCOY, Esq., F.G.S., Honorary Fellow of the Cambridge Philosophical Society, Professor of the Natural Sciences in the University of Melbourne, Government Palaeontologist, and Director of the National Museum.*

[Read before the Royal Society, 25th June, 1860.]

My great dislike of controversy, and my belief that the time of a scientific man may be better employed in endeavouring to add new facts to the general store of human knowledge, than in defending himself or his views, when once put forward, would certainly have induced me on this occasion, as on most similar ones, to let my opponent’s views and mine stand without discussion for the judgment of those concerned. Having, however, been honoured with a request—which to me is a command—to furnish a written comment on Mr. Clarke’s paper to the Royal Society this evening, I do so cheerfully; and the more so as it is just possible that some members of this Society might feel inclined to attach some weight to any deliberate statement of mine on natural science, and not having time to sift the evidence for themselves, might wish to hear my reply when such statements were controverted.

I will pass over without remark the apparent discourtesy in the first paragraph, in which (without having seen the fossil) he doubts my assertion, made at the last meeting of the Society, that a fossil fern from the coal rocks at the mouth of the Bass River belonged to the genus *Teniopteris*. I will simply prove my assertion, if not to the satisfaction of Mr. Clarke, certainly to that of every one else, including one authority at least (Dr. Mueller), to whom, I believe, he admits the necessity of paying deference in botanical matters. Mr. Clarke has been at the pains to copy out, in the concluding part of his paper, the true generic characters of *Teniopteris*, as he accepts it, from the works of Brongniart, Göppert, and of Lindley and Hutton. I was not ignorant of these characters, when I referred my fossil to

the genus in question at our last meeting; and I now prove that it possesses all those characters (including the furcation near the base of some of the secondary nerves, underlined strongly in Mr. Clarke's manuscripts), by laying the specimen again on the table, for the satisfaction of those present, and by giving Dr. Mueller's written testimony* that he had compared the specimen with Brongniart's definition, and finds my previous determination rigidly exact on the strictest view of the genus—for the satisfaction of those at a distance.

Having now, I hope, satisfactorily vindicated the generic character of our Victorian *Teniopteris*, we may consider the next point in the same paragraph, namely, Mr. Clarke's protest against those geologists "who maintain that a formation so abundant in zoological fossils as the jurassic is found here, where no one in any part of the Australian continent has ever detected one single species, on the strength of the evidence derived from a few (probably not six in all) species of plants, the true description of which does not agree in all things with the typical characters of the genera under which the species are ranked." On this I would remark—1st. That the number of species of plants, described by competent authorities in English and German books, from the coal beds of Australia is not six, but twenty-three. All of these are more allied to oolitic than to palæozoic types, and of five entire genera of them—viz. : *Glossopteris*, *Teniopteris*, *Phyllotheca*, *Zeugophyllites*, and *Vertebraria*—no single species has ever been found in any undoubted palæozoic coal-field in any part of the world; while, of the other genera, two species are scarcely separable by any tangible characters from species of the oolitic coal-beds of Scarborough. 2nd. The very nature of generic groups is such that no naturalist expects *all* the species of a

* (Copy of note from the Government Botanist to Professor McCoy.)

Melbourne Botanical and Zoological Gardens,
21st June, 1860.

MY VERY DEAR SIR—

To so world-famed celebrity amongst palæontological authors as yourself, it is perfectly superfluous to state that the Victorian fossil determined by you as an undescribed species of *Teniopteris*, accords fully with the generic diagnosis originally published by Brongniart (Prodr. 16); but as you were particularly desirous that I should compare this new species of the genus *Teniopteris* with recorded definitions, I gladly responded to your request, and beg to give it as my opinion that I regard the *T. Daintreei* in no way different from its congeners.

Most respectfully, dear Professor, yours,

(Signed)

FERD. MUELLER

Professor McCoy, &c., &c.

genus "to agree in all things with the typical characters of the genus;"—this would require nearly as many genera as species, and destroy the advantages of the larger groups. The accepted rule might be roughly exemplified thus: If a genus be characterised by three positive characters, *one* of them may vary in any species which, possessing the other two unaltered, might be classed with the given genus; but different species would not necessarily vary in the same character. Apart from this general illustration, I may observe that the generic references of the Australian fossil plants have never been objected to by botanists, and they have all been carefully made by observers (except myself) of universally acknowledged accuracy. 3rd. As for the objection that the plant beds cannot be oolitic, because no oolitic animal remains have been found, there is nothing in it; for at Richmond, in Virginia, there is a coal-field twenty miles long, with beds of coal forty feet thick, worked by shafts one thousand feet deep, the coal-beds, accompanied by layers of fossil plants, having a strong general resemblance to those of the New South Wales coal deposits, the whole series being, after deliberate survey and examination (amongst others by Sir Charles Lyell and Professor Rogers), distinctly and unanimously referred to the oolite* formation by all the geologists and palæontologists of America and Europe; and yet, in the whole of North America, though more fully examined than New South Wales by geological surveyors, not a trace has yet been found of any oolitic zoological fossil.

Mr. Clarke's next paragraph says, "The two genera, "*Teniopteris* and *Glossopteris* (*Sagenopteris*) have been the "means of placing, by some geologists, the coal deposits of "Australia and India in the horizon of the oolitic coal. Now, "the latter occurs in five distinct formations in India, as Mr. "Oldham informs me, and it also occurs in Africa, where the "evidence appears to be against the supposed epoch." This paragraph shows that Mr. Clarke has missed some important links in the chain of reasoning by which I considered the coal rocks of the Hunter related in geologic age to the oolitic formation. I rarely take the liberty, in any paper of mine, of stating

* Very recently the suggestion has been discussed of the "Triassic" age of these American beds, but the evidence is inconclusive, and at farthest the trias is as much mesozoic as the oolites, and the discussion in question would not help Mr. Clarke's position of his Newcastle plant-beds being of the Palæozoic Carboniferous age of the underlying marine-beds with Trilobites, nor invalidate my view of their mesozoic character.

anything which might be assumed to be known to the reader from a study of previous writers; and when, in former papers, I used the identity of the fossil plants of the Indian and Australian coal-fields as one step in the comparison of the latter with the oolites of Europe, I was not simply arguing in a circle, as Mr. Clarke seems to suppose, but making use of the knowledge published to geologists for more than twenty years that in India these coal plants are accompanied by abundance of ammonites and other marine zoological fossils, having the clearest relations with the lower oolitic fossils of the clear sections of Europe. I thus, by a fair philosophic process, transferred to the Australian beds the whole of the geological arguments applied to the identical Indian ones from the association with the latter of those zoological fossils, the absence of which in Australia, Mr. Clarke attempts to use in a powerful manner, but for which I just now indicated an exact parallel in America. Mr. Clarke, in the above paragraph, putting the word "*Sagenopteris*" in brackets after "*Glossopteris*" when speaking of the Indian and Australian plants, proves that he cannot have read Professor Presl's remarks, when founding the genus *Sagenopteris*, in Sternberg's "*Versuch einer Geognostisch-botanischen Darstellung der Flora der Vorwelt*," as the very object of establishing the genus was, by separating some abnormal European forms, to leave the Indian and Australian plants *as the true types of the genus Glossopteris*. Mr. Oldham's quoted statement of *Glossopteris* occurring in five distinct formations in India, is only intelligible on the supposition that the word "formation" is used—not in the technical sense of geologists, but as synonymous with "bed." The reference to the occurrence of *Glossopteris* in Africa, as supporting the view of the palæozoic coal age of the genus, is also unhappy, as the researches of Dr. Rubidge clearly prove that the *Glossopteris* of Bloemkop, in South Africa, are only found in the Karoo beds containing the bones of the *Dicynodon*.

Mr. Clarke's next paragraph states:—"As to *Teniopteris*, so far from determining the age of a formation, Jukes, who follows Bronn, assigns the species thus:—

" Carboniferous 1	}	Oolite 6, not 7.
Permian 2		
Trias 3		
Oolite 6		
Tertiary 1		
		"

I have no doubt Mr. Jukes would be much surprised to find himself quoted as an authority on Palæontology: he describes himself, in a note, as ignorant of the subject; and the many errors in that part of his book should not, therefore, be counted against him. But as the Rev. Mr. Clarke has undertaken to overwhelm me with this authority, I suppose I am bound, as a mere matter of courtesy, to return him a few taps with the same weapon. Mr. Clarke's extract above is from p. 375 of Jukes' Manual, but if he had read his own authority as far as p. 437, he would have found a list of the genera of plants dating their appearance in time from the carboniferous epoch, and that *Teniopteris* was not there. If, again, he had continued his studies of his author to p. 462, he would have found a list of the plant genera dating from the Permian, and that *Teniopteris* was not there. If the perusal of his book had extended to p. 466, the list of genera of plants originating in the Trias would have been found, again without *Teniopteris*; and if, finally, he had been so unhappy as to have read to p. 473, he would have found the authority of his own choice distinctly marking *Teniopteris* as a genus of plants which *commenced and ended its existence with the oolitic or jurassic period*. This is probably enough for the present of this authority; and I will now lay before the Society a somewhat better list of the distribution of clearly ascertained species of *Teniopteris* (Mr. M'Lelland's two Indian species being omitted, as I have not his report at hand):—

Tabular View of the Geological Distribution of the clearly ascertained Species of the Fossil Genus Teniopteris.

TENIOPTERIS.

None from
the Coal.

2. { P. *abnormis* (Gutbier) Rotheliegende, Planitz ;
Permian. { Saxony.
P. *Eckhardi* (Germ.) Copper Slate; Mansfeld.

2. { Tr. *marantacea* (Stern.) Keuper; Stuttgardt.
Keuper. { Tr. *Schænleini* (Ettingsh.); Keuper.

14. Oolite. { O. *obovata* (F. Braun.) ; Lias.
 O. *vittata* (Brong.) Lias and Oolite ; Whitby.
 O. *Zoebingiana* (Ettingsh.) ; Weald.
 O. *ovalis* (Presl.) Oolite ; Scarborough.
 O. *major* (Lindley and H.) Oolite ; Yorkshire.
 O. *magnifolia* (Rogers.) Oolite coal-field ; Virginia.
 O. *Asplenioides* (Ettingsh.) ; Lias.
 O. *Münsteri* (Göppert) ; Lias.
 O. *Haidingeri* (Ettingsh.) ; Lias.
 O. *Scitaminea* (Presl.) ; Stonesfield Slate.
 O. *latifolia* (Brong.) ; Stonesfield Slate.
 O. *Danaeoides* (Royle sp.) ; Burdwan coal beds.
 O. *Phillipsi* (Presl.) Oolites ; Yorkshire.
 O. *Nilssoniana* (Brong.) Jurassic beds ; Coburg.
 2. Tertiary. { T. *Bertrandi* (Brong.) Tertiary ; Lombardy.
 T. *Ungeri* (Ettingshauser) ; Tertiary.

No trace of *Teniopteris* has ever been found in a palæozoic coal bed : the erroneous carboniferous citations in many books of this genus—like those of *Glossopteris*—referring to the occurrences in the Indian mesozoic coal-fields. Two doubtful species are Permian, 2 upper Triassic, 14 highly typical forms Oolitic, and 2 Tertiary. The evidence from known species is therefore overwhelmingly in favor of any rock containing a typical *Teniopteris* being oolitic, and decisively against its belonging to the palæozoic coal epoch, supported by Mr. Clarke.

In his next paragraph Mr. Clarke says:—"When we come to Yorkshire, which is one of the references, we find in Phillips no figure of any species of *Teniopteris*." At our last meeting I stated that the new *Teniopteris Daintreei* was most nearly allied to the *T. vittata* (Brong.) of the Whitby oolitic shales figured in Phillips' Geology of Yorkshire, t. 8, f. 5. I have the figure referred to under my eyes, and now lay it on the table for the inspection of members. As Mr. Clarke, however, denies its existence, there is no more to be said on the matter. The next part of this paragraph, and portions of several subsequent ones, are taken up with some involved confusions about the genus *Aspidites* of Göppert. In brief, this is so unnatural a group (formed of portions of various genera of various ages), that it has been unanimously rejected by all more modern writers ; and Mr. Clarke's or

Göppert's references of *Tæniopteris* thereto is against the sense of Ettingshauser, Morris, Bunbury, and all the other highest living authorities on fossil plants. This paragraph concludes with a statement that it is unphilosophical for me to assign an epoch to the Australian coal without stratigraphical evidence, and on the indication of plant genera, "referable to more than the assumed epoch." To which I reply that all the known stratigraphical evidence is in my favor, and that the plant genera are *all admitted* as belonging to the mesozoic epoch for which I contend; but they *do not* belong to the epoch for which Mr. Clarke contends, and that seems just the difference between our positions—that *all the evidence*, as far as it goes, is in my favor, but wherever of a distinctive nature, is against my opponent.

The next paragraph of Mr. Clarke's paper commences with a notice of the reasons which induced Morris, Strzelecki, and myself to form our opinions on the age of the coal and underlying formations in New South Wales and Tasmania, which, I consider, gives so imperfect a view of the question, that I must state it differently:—About twelve years ago I examined critically a very large collection of fossils sent to England from these rocks, by Mr. Clarke, and formed an opinion on the age of their formation, from such data, different from that to which Mr. Clarke had pledged himself before the necessary data for forming an opinion had been examined. The reasons for my conclusions I will briefly quote from the concluding part of a paper I published on the subject eleven years ago, in the *Annals and Magazine of Natural History*:—

"In the above notice" (I state after describing the fossils)
 "I have given eighteen species of fossil plant from the Mulu-
 " bimba district, which is a portion of the great Newcastle
 " and Hawkesbury basin, twelve of which are considered new,
 " Those plants belong to ten genera, two of which—*Vertebraria*
 " and *Zeugophyllites*—are only known here and in the supposed
 " oolitic coal-fields of India; one genus (*Gleichenites*) I have
 " provisionally used for the *Pecopteris odontopteroides* of Morris,
 " from the verbal characters given by Göppert for that genus,
 " the species of which are found only in the palæozoic coal;
 " the plant, however, agrees much better with the species of the
 " Keuper genus *Heptacarpus* than with those of the carboni-
 " ferous *Gleichenites*; and if we look rather to the plants them-
 " selves than to the definitions given of the genera, I should
 " certainly place it there. All the other genera (with the

“exception of *Phyllothea**, which is confined to the locality)
 “are well known in the oolitic coal deposits of Yorkshire, and
 “one species, the *Sphenopteris germana* (McCoy) is scarcely to
 “be distinguished from the common *Pecopteris Murrayana*
 “(Br) of the Scarborough shales. Several of these genera
 “are common both to the carboniferous and oolitic periods;
 “but the most abundant and characteristic plants of the
 “Australian beds belong to a genus (*Glossopteris*) never found
 “in the old coal-fields, but several species of which are, on the
 “other hand, well known in coal-beds of the oolitic age in
 “various parts of the world. I am, therefore, strongly of
 “opinion, from the evidence of more than double the number
 “of species of plants known before, that the coal deposits of
 “Australia should be referred to the oolitic period; and this
 “opinion derives much additional weight from the negative
 “fact that, among the large quantity of remains of plants
 “which I have examined from this district, not a trace has
 “been observed of any of the characteristic carboniferous
 “genera—not a trace of *Lepidodendron* or any allied plant—not
 “a trace of *Sigillaria*, *Favularia*, *Stigmaria*, or even of true
 “*Calamites*. I might further add, that the list of plants I have
 “given destroys any negative arguments formerly based on the
 “fossil evidence for considering the Jerusalem coal basin to be
 “of a different age from the Newcastle one, as I have detected
 “the most characteristic plants of the former abundantly in
 “the latter beds, so that the fossil evidence now would go with
 “the admitted identity of the walls of the basins, and the
 “general analogy of the sections to prove them all of one age.

“In the underlying rocks I have been able to determine
 “83 species of animal remains, of which 14 are *Zoophyta*, 3
 “*Criniodea*, 4 *Crustacea*, 25 *Brachiopoda*, 24 *Lamellibranchiata*,
 “6 *Gasteropoda*, 4 *Pteropoda*, and 3 *Cephalopoda* (including
 “*Bellerophon*); of these, 4 genera and 32 species are figured
 “and described as new. These 83 species belong to 39 genera,
 “all of which (with the exception of the genera *Tribrachyocrinus*,
 “*Pachydomus*, *Notomya*, and *Eurydesma*—new forms—at
 “present only known in Australia) are abundant in the carbo-
 “niferous rocks of Britain, many of them not being found in
 “any higher series, and several of them not being known in
 “any older deposits, so that the age, even if *we only look to the*
 “*genera of the fossils*, is clearly limited to the carboniferous
 “period; but when we descend to the critical examination of

* *Phyllothea* has, since the Paper was read, been also discovered in the Oolitic Sections of Europe by de Zigno.

“species, we find so extraordinary and unexpected an amount of agreement between these beds and the similar shales, sandstones, and impure limestones forming the base of the carboniferous system in Ireland, that it is impossible not to believe them to be nearly on the same parallel; and there is equal difficulty in imagining them to be either younger or older than those deposits. Of those species no less than 11 are believed to be positively identical, on the most careful comparison of the Australian and Irish specimens; and nine more are so closely allied that it has been found impossible to detect any difference of character, as, either from imperfect preservation or want of sufficient specimens to display, all the characters have not been specifically identified. With such evidence as I have mentioned, I do not think it improbable that a wide geological interval occurred between the consolidation of the fossiliferous beds which underlie the coal, and the deposition of the coal measures themselves; that there is no real connection between them, but that they belong to widely different geological systems, the former referable to the base of the carboniferous system, the latter to the oolitic, and neither showing the slightest tendency to a confusion of type.”

Since the above was written, Mr. Dana, who in 1839 published his observations, with the American Exploration Expedition, visited the localities, and got several more fossils, without causing any alteration in the above views; and a few years ago Mr. Selwyn, the director of the Victorian Geological Survey, made an official survey of the Tasmanian coal-fields, in which Count Strzelecki thought the clays containing large shells of the genus *Pachydomus*, such as are found *under* the coal-beds at Newcastle, seemed doubtfully to *overlie* the coal-beds of Tasmania, which would thus be proved to be of the same age as the underlying palæozoic shell-beds. Mr. Selwyn found the *Pachydomus* beds, however, all in their true normal position, *under* the coal everywhere in Tasmania as in New South Wales, thus clearing away the only even doubtfully suggested stratigraphical objection to my views. It may also be satisfactory for me to state that all the information I have been able to acquire, for the last twelve years, bearing on the question, and derived from N. S. Wales, Victoria, or Tasmania, stratigraphical as well as palæontological, tends to confirm my original impression above quoted, and that I know of no fact invalidating it, or which, in fairness, I could state on the other side.

I now, with much reluctance, approach the most disagreeable part of my task. On the publication of my results, as above quoted, Mr. Clarke, as he states in the paragraph of his paper we have now reached, wrote to the English journals, asking geologists to suspend their judgment—the point going against him; and, shortly after, he wrote to a leading geologist and mutual friend, to this effect: “Mr. McCoy’s most powerful argument against my view of the palæozoic age of our Newcastle coal-beds, is founded on the supposed absence of all the characteristic genera of true coal-measure plants. I should like to have his opinion of the enclosed fossil, which I think will satisfy him.” My opinion on the fossil enclosed was, that it was a distinct species of one of the sections of *Lepidodendron*, clearly indicative of the true palæozoic coal epoch; to which I added the reasons for my equally strong opinion *that it never came from the beds we were arguing about*. Every one who saw Mr. Clarke’s letter thought it impossible to doubt his meaning, that the fossil he sent to upset my objection that no coal-measure plants had been seen in certain beds, came from those beds; as I was positive, however, the pointed questions were put to him—“Did you find the specimen yourself, and did it come from the actual beds which afforded the other plants on which the dispute turns?” The tardy admissions were thus extracted from him:—That the specimen of *Lepidodendron* had been given him by an unscientific friend, and came from a geologically unknown locality far to the north, in the country now called Queensland; so, that instead of invalidating my conclusions, my views were strengthened by the proof, that the palæozoic and oolitic coal formations might be found near together in Australia (as in England and America), each with characteristic distinctive palæontology; and here, as in Virginia, the vague baseless supposition (revived in the present communication of Mr. Clarke), that the geographical distance from the European types might have caused the palæozoic formations to assume the palæontological characters of the oolitic ones, falls to the ground as unsupported by new facts, as by induction from the old ones. Mr. Clarke, in his present communication, says:—“Others besides myself have found some of the missing true coal-plants, and I am now in a position to point out six localities in this colony and in Queensland where they are to be found.” On which I remark, that they are not, however,

found in the beds in dispute, *nor mixed with* the plants to which I have assigned a mesozoic age, as any reader of Mr. Clarke's paper would be in danger of taking for granted. As to the specimen he alludes to in the Melbourne Museum, the Government Geologist can testify that, on first seeing it, some years ago, in a store in Melbourne, I at once characterised it to him as the most important palæontological specimen ever found in the colony, as it proved the existence of the true palæozoic coal formation in Gipps Land; and, I further told him, it was of the same species as a fragment sent many years ago from the Moreton Bay district by Mr. Clarke, and the specimen was distinctly pointed out to Mr. Clarke, when he visited the Museum, as one likely to interest him.

In his next paragraph Mr. Clarke says, "He was slow in admitting what I stated to him in February last, that now we have found in New South Wales coal seams in the very heart of his mountain limestone fossils, and that plants known in the Newcastle beds, which he calls oolitic, were found at the very bottom of the whole series of these newly opened beds, containing the M. L. fossils." The facts of the case are these, and can be vouched by the Government Geologist.* Mr. Selwyn brought me, at the date mentioned, a fragment of shale with the Newcastle species of plants, which he said Mr. Clarke had brought from the bottom of a coal-pit, the sides of which gave a clear section, showing the marine carboniferous fossils at a certain distance from the surface less than the depth from which the plants came, so that he supposed the matter in dispute was finally decided. I asked him if Mr. Clarke had himself got the specimen, and could himself vouch for the existence of a bed containing such plants below the bed of marine zoological fossils. Mr. Selwyn had no doubt that the words and sketches of Mr. Clarke clearly and unmistakeably conveyed the impression that he had. To Mr. Selwyn's astonishment, however, it turned out, on my pressing Mr. Clarke, who then joined us, that he had never been at the spot; that the bit of stone had been brought up by one of the workpeople from the bottom of the pit, sunk through the coal beds, intercalated with shales containing the Newcastle species of plants into the underlying marine beds; that there was no evidence whatever of a

* Mr. Selwyn, the Government Geologist, was present when the above paper was read, and confirmed the references made to him.

bed containing the plants at the bottom of the pit, but that such specimens as had been made use of as a geological argument might tumble in *from the coal beds in the upper part of the pit*, and fall to the lower part, composed of the mountain limestone beds, every hour of the day; and might be brought up, like any other extraneous matter, in the way in which the fragment in question had. Mr. Clarke's final phrase, in answer to some remonstrance of Mr. Selwyn, who found the arguments which he had accepted in the morning entirely without foundation, being his often repeated one, "that nevertheless he was quite satisfied they were all of one age." This phrase Mr. Clarke continually used in writing to English geologists on the evidence afforded by his stratigraphical sections, until at my suggestion pushed to give an accurate representation of any actual case in point, instead of vague assertions, when it proved that he had not a single section in support of his view, and even up to February last he had not been able to find one either in New South Wales, Victoria, or Tasmania.

As to the Bacchus Marsh and Darley sandstones, I have not yet seen perfectly decisive specimens from them of the *Glossopteris*, but there are abundance of fronds of a new genus*, to which belongs the plant I have figured from the New South Wales coal beds under the name of *Cyclopteris(?) angustifolia*, which occurs there, as well as in India, with the *Glossopteris*, and has exactly the same geological significance as the *Glossopteris* for the Bacchus Marsh sandstones, in which the *C. (?) angustifolia* is distinctly present.

In conclusion, I feel that some apology is due to the Society for occupying so much time, but at the same time I would remind the members that I said all I had got to say on the discovery of the *Teniopteris Daintreei*, and its geological significance, which I considered worth saying, in less than five minutes at our last meeting; to which I will add, that I shall be the first to communicate to the public, through the Society, any fact which may hereafter come to my knowledge tending to weaken the views I hold, and which I have been defending simply from a sincere belief in their accordance with truth.

* This genus I have called *Gangamopteris*, the chief characters being those referred to in my old paper quoted above, as separating the plants in question from *Glossopteris* on the one hand, and from *Cyclopteris* on the other.